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NORTON-CoMo-v0.91-28Oct02

Logical View Report

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NADM Data Model Design Team (DMDT)

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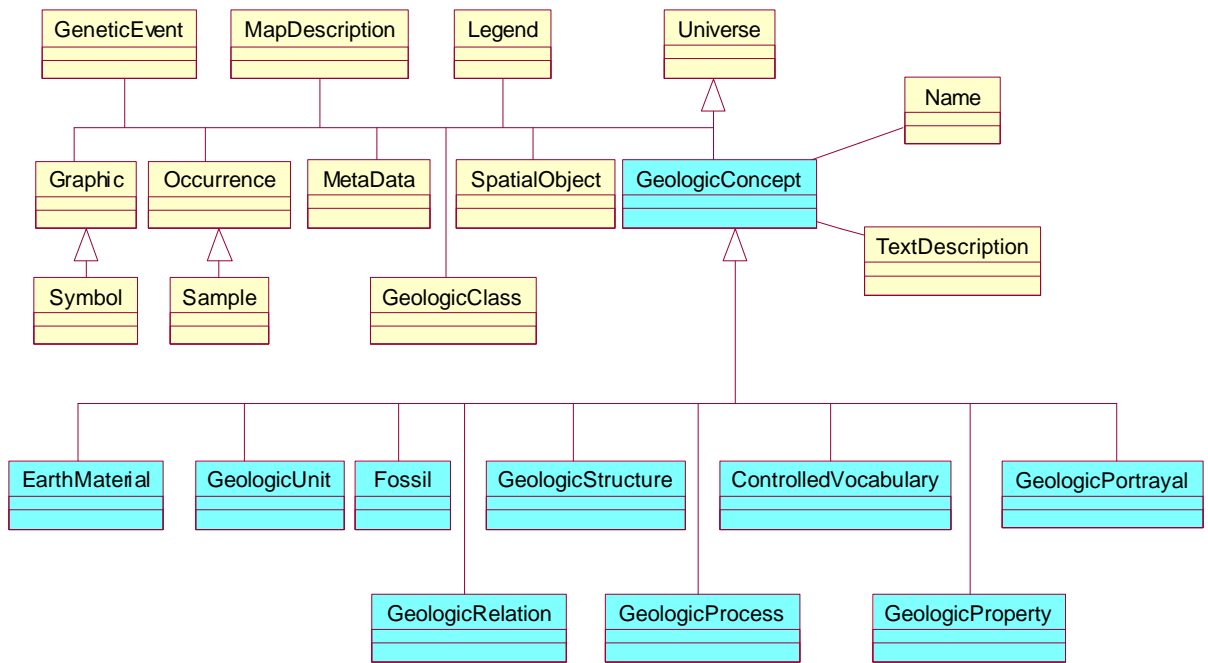
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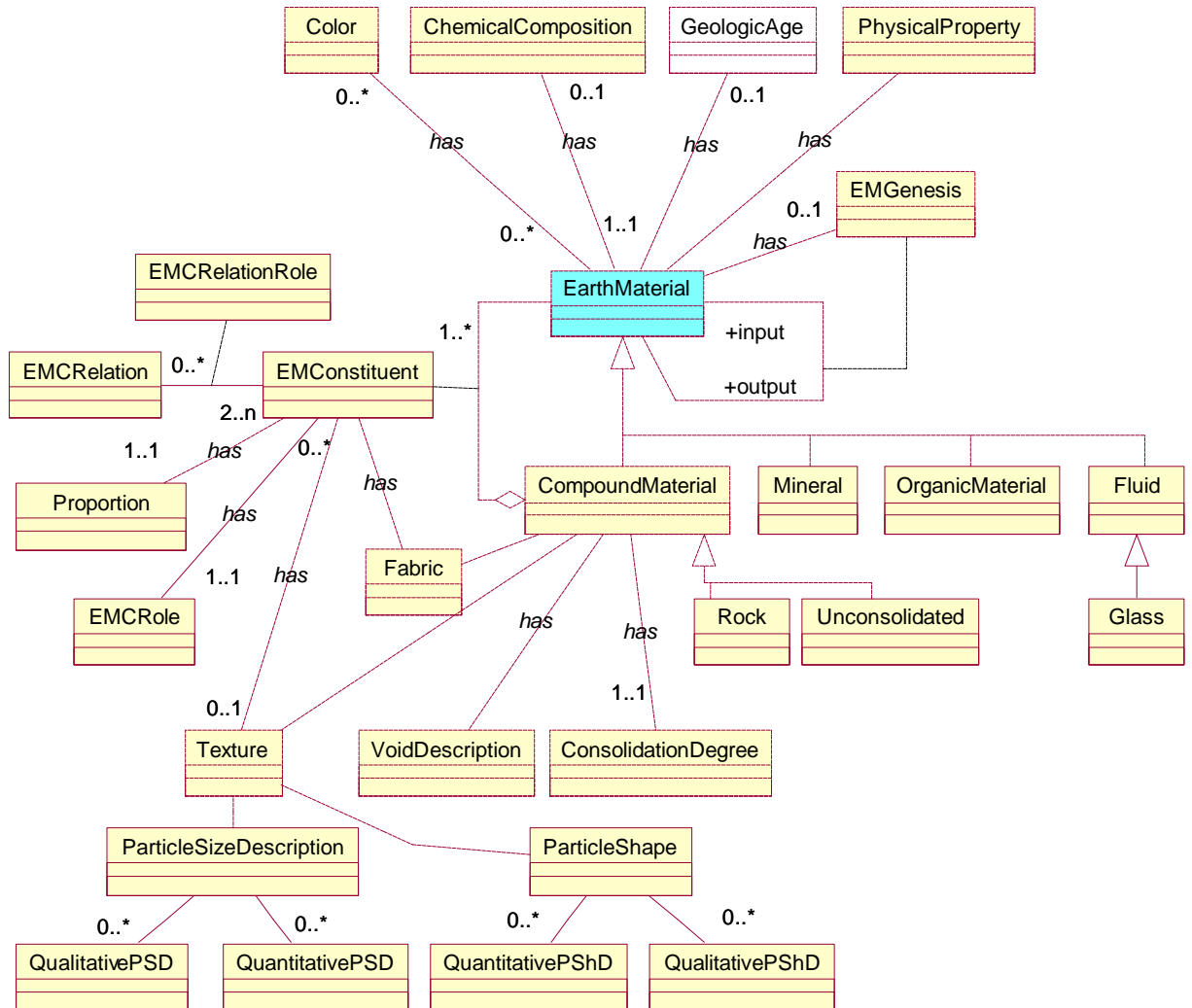
LOGICAL VIEW REPORT

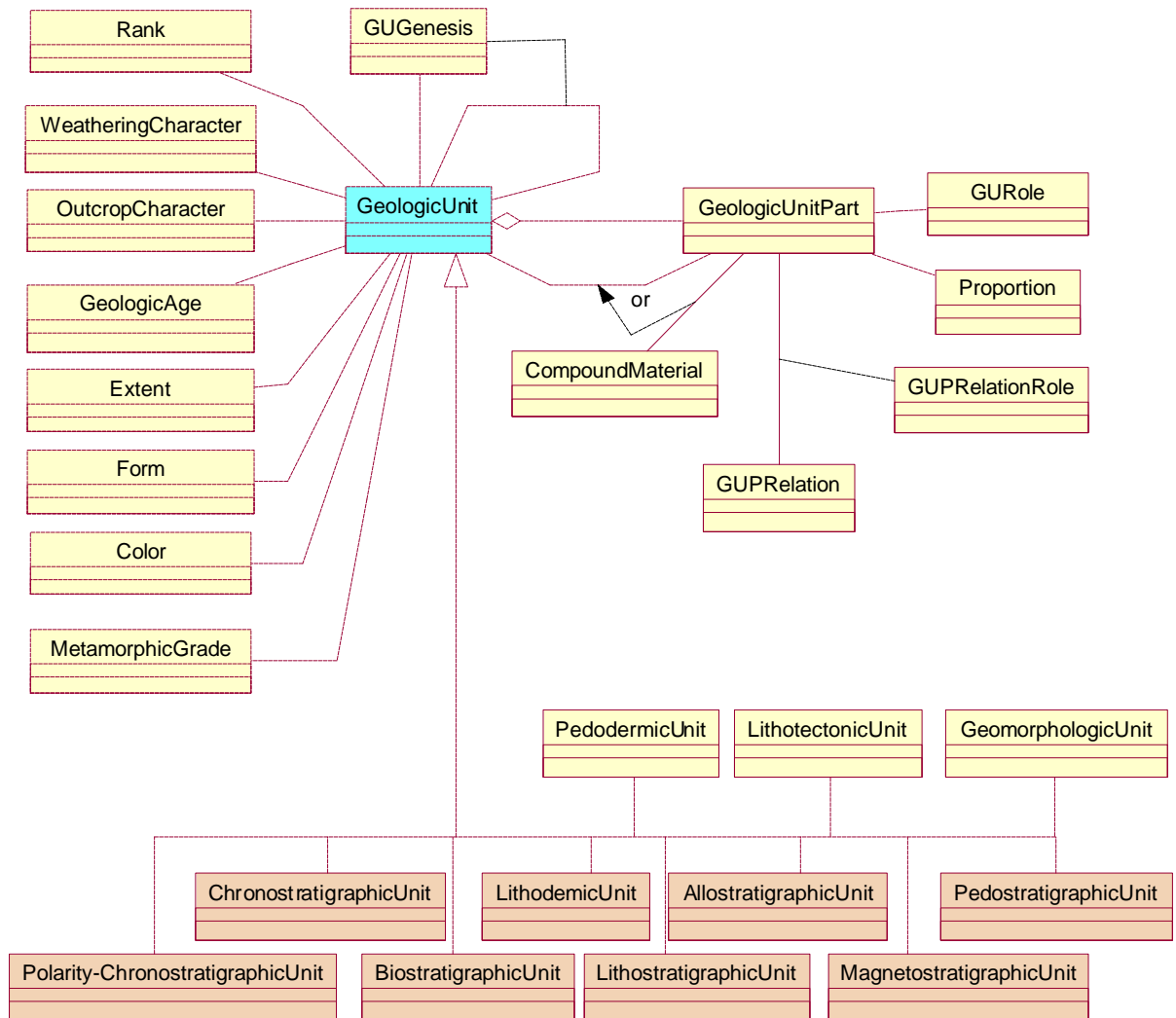
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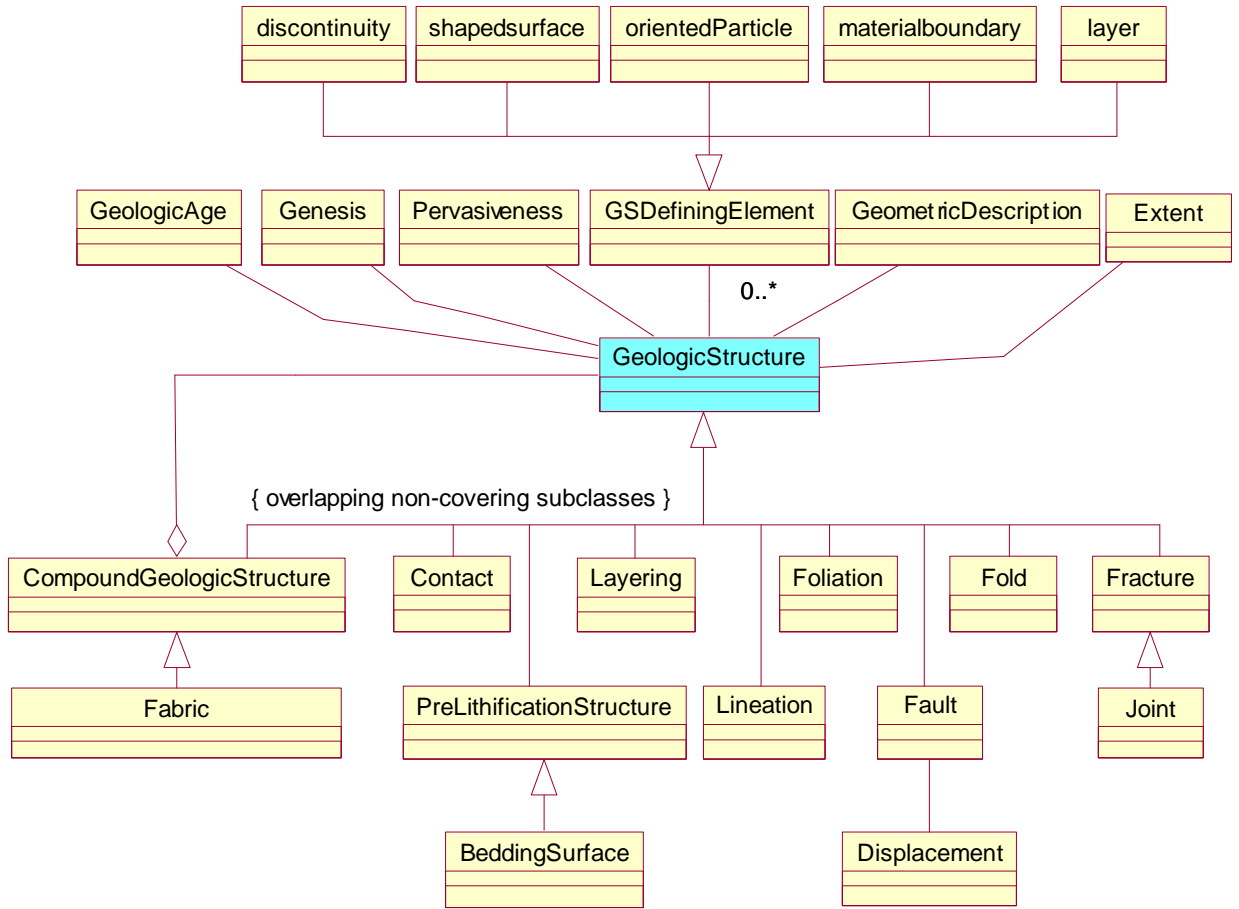
Geologic Concept

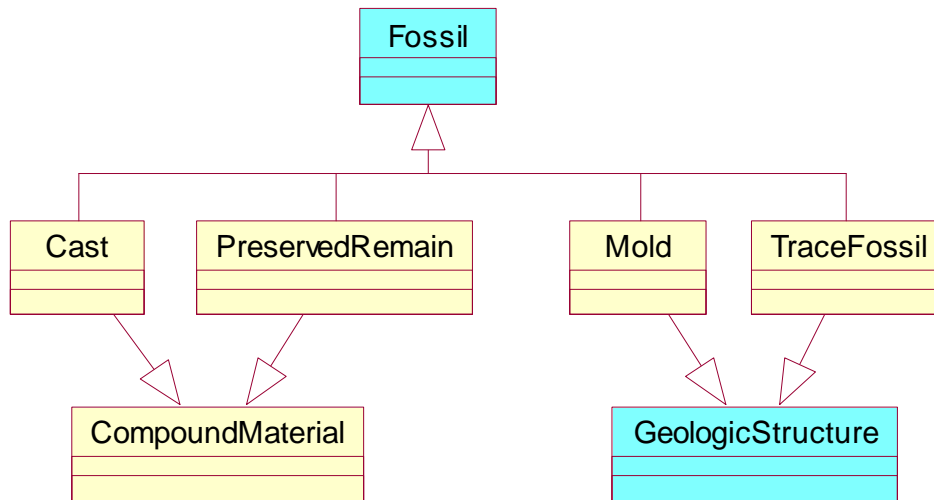


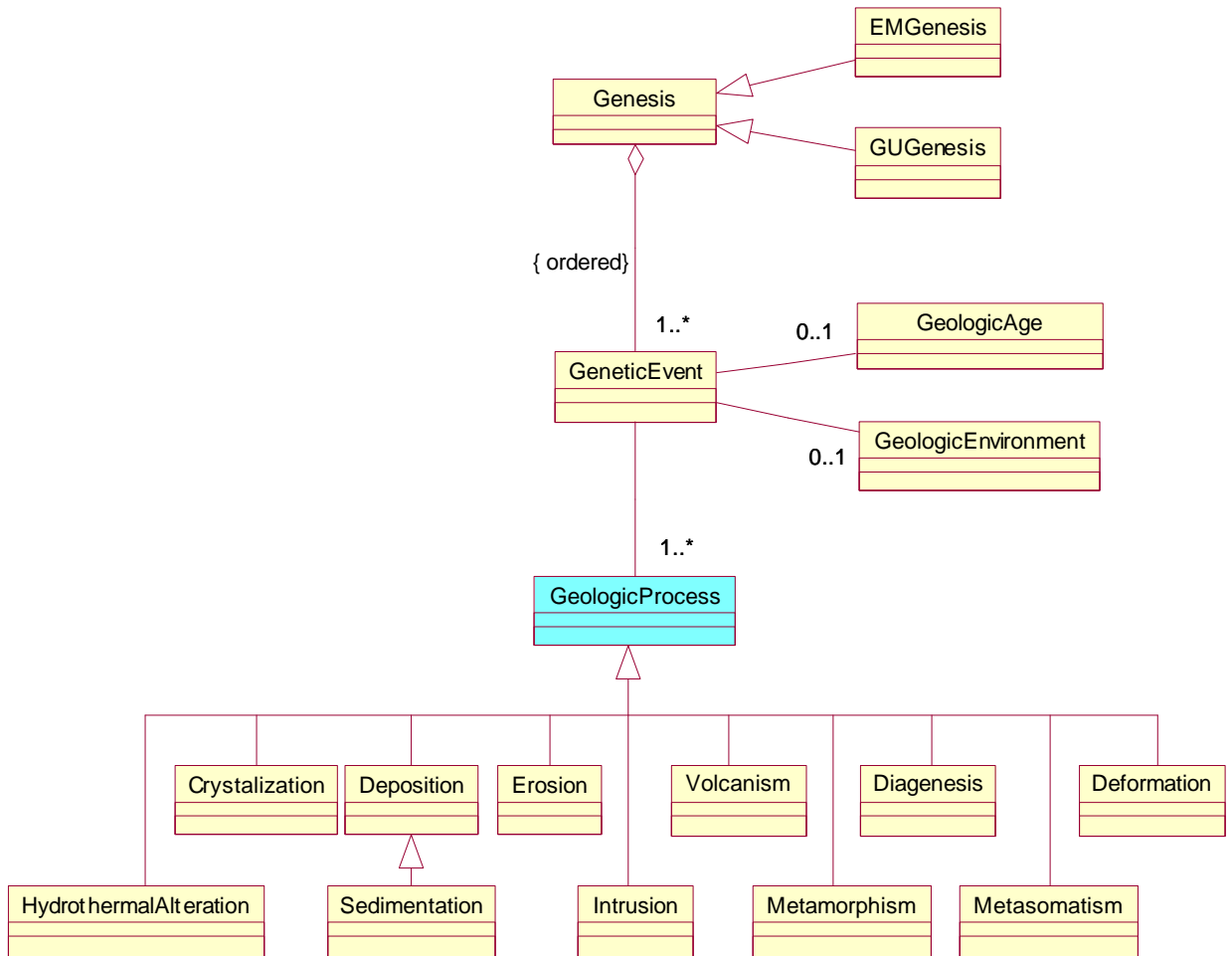
Earth Material

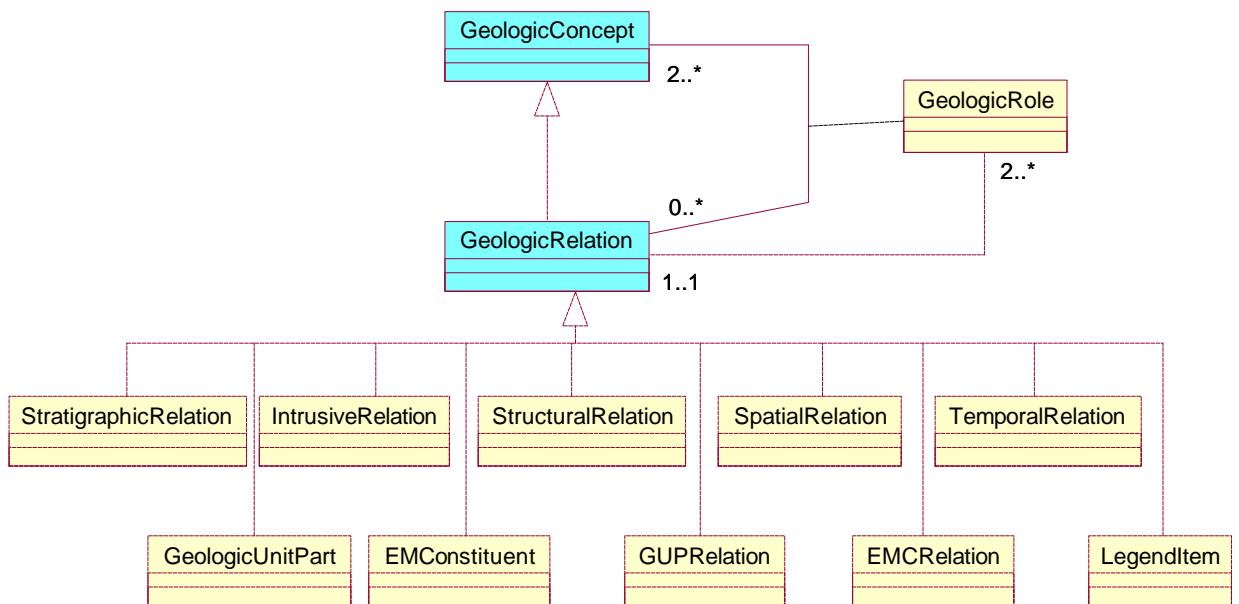


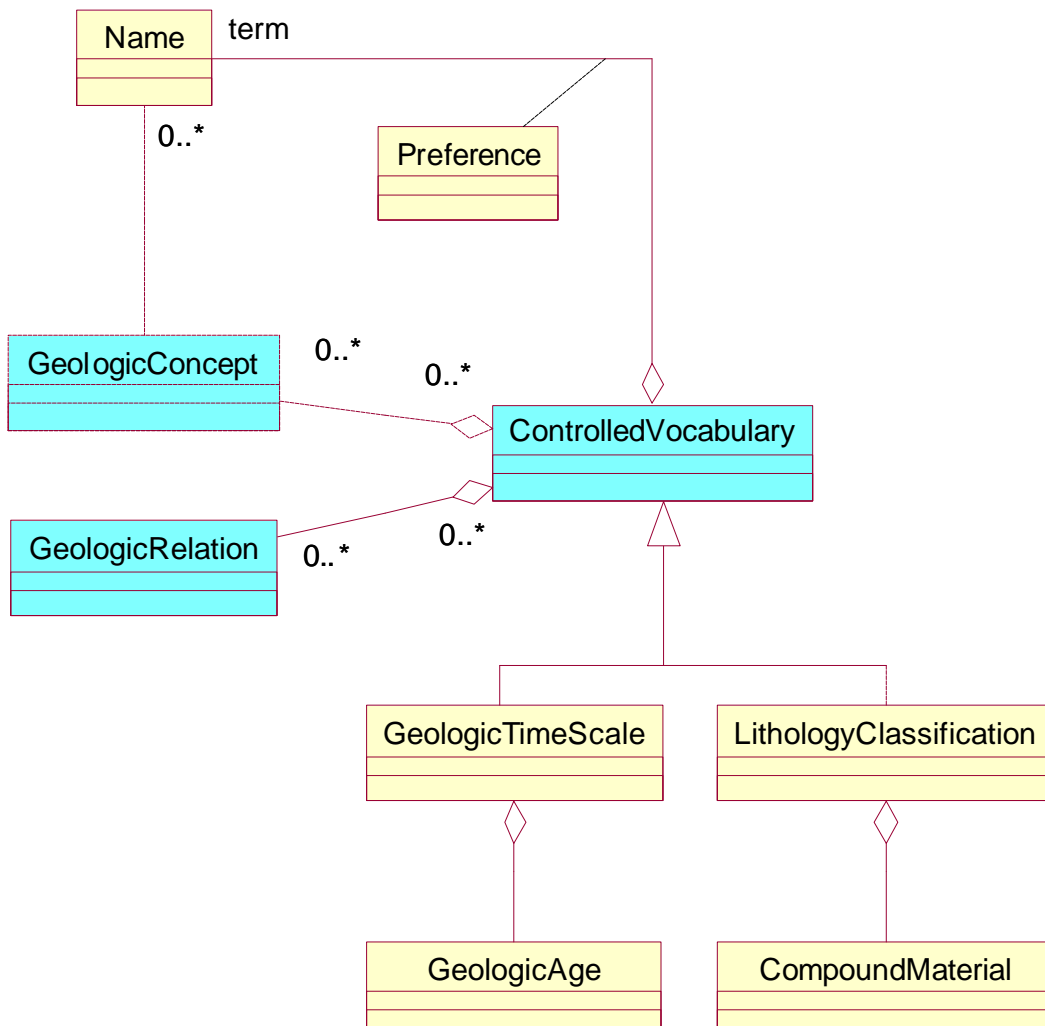
Geologic Unit

Geologic Structure

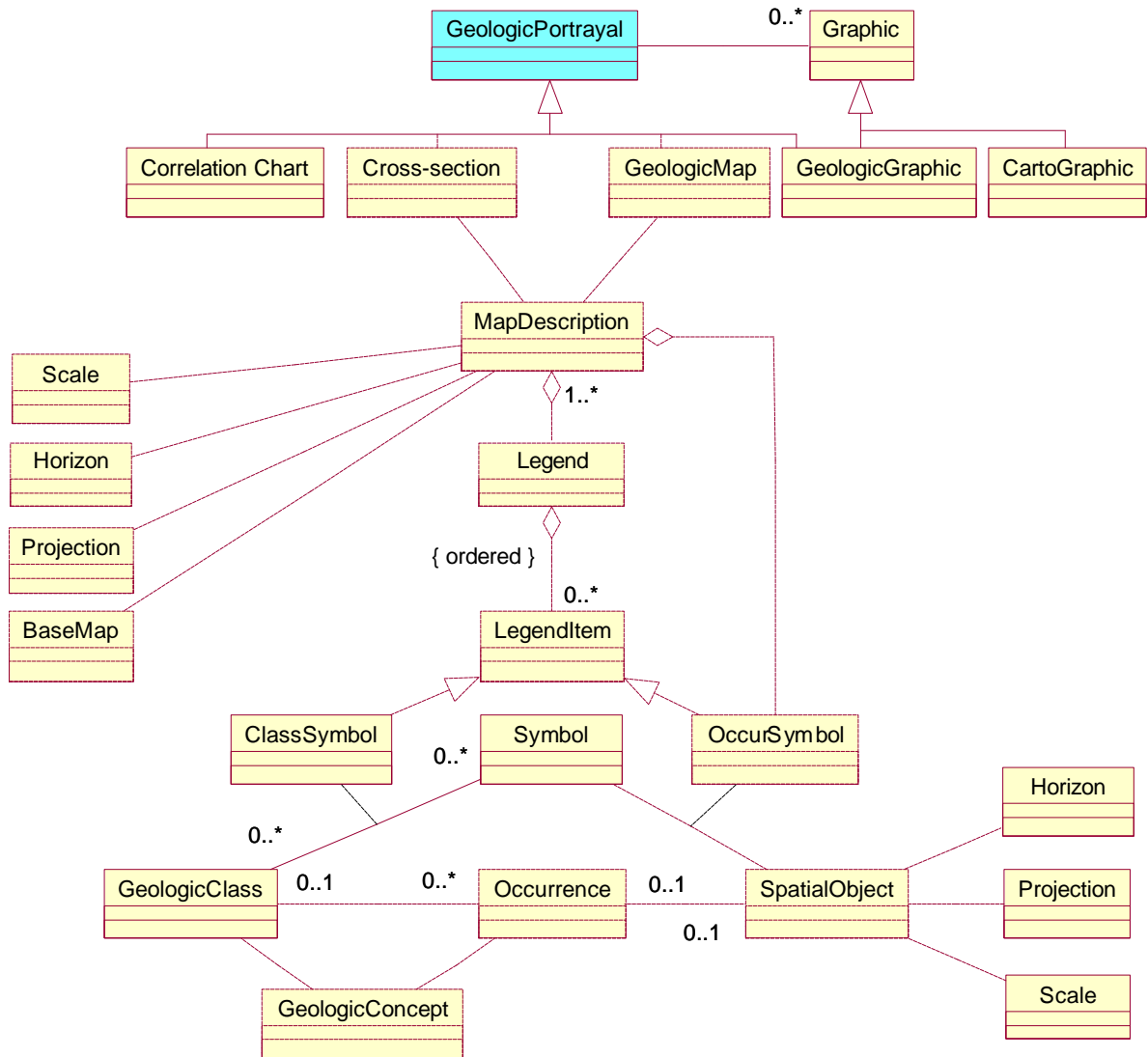
Fossil

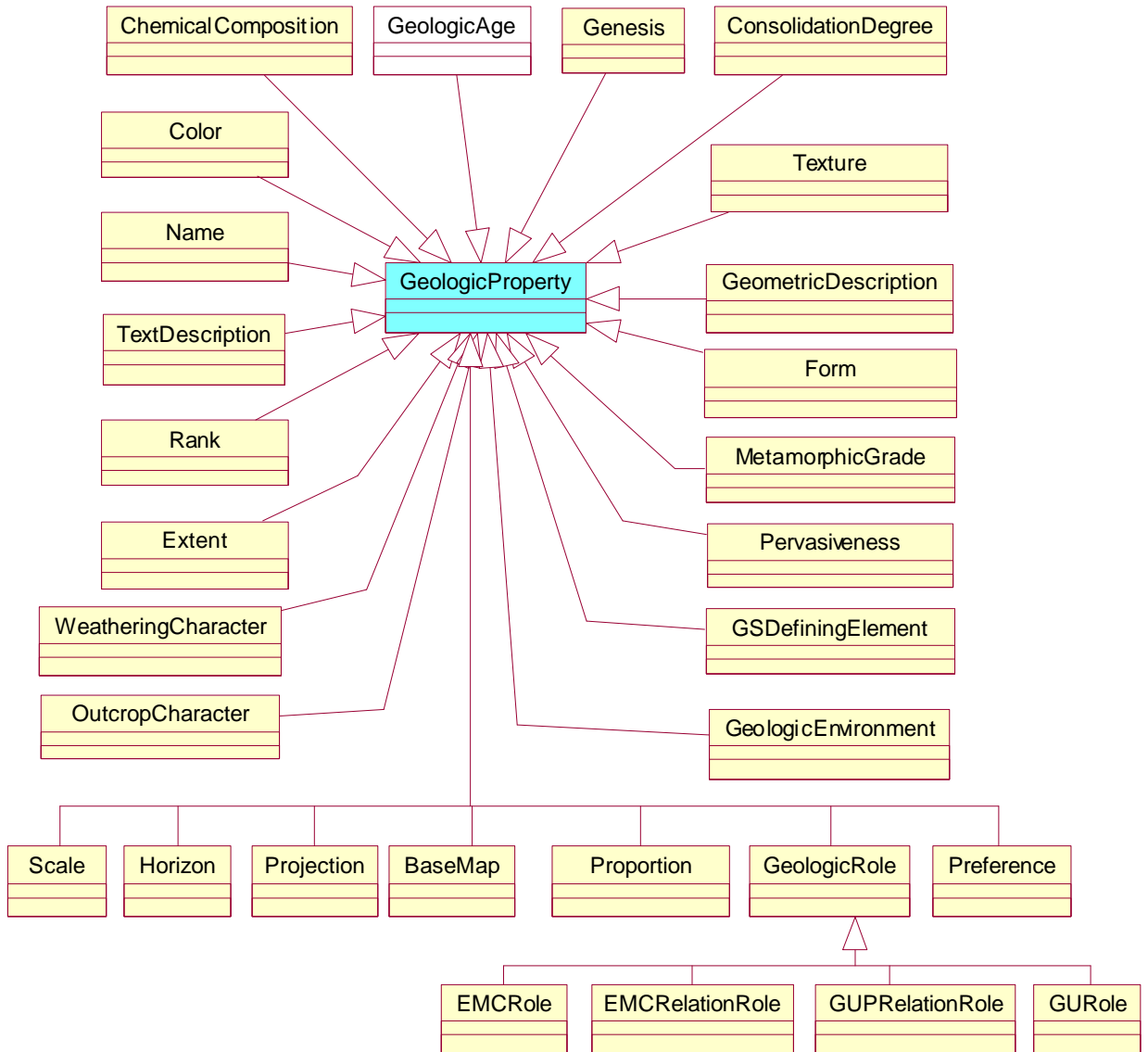
Geologic Process

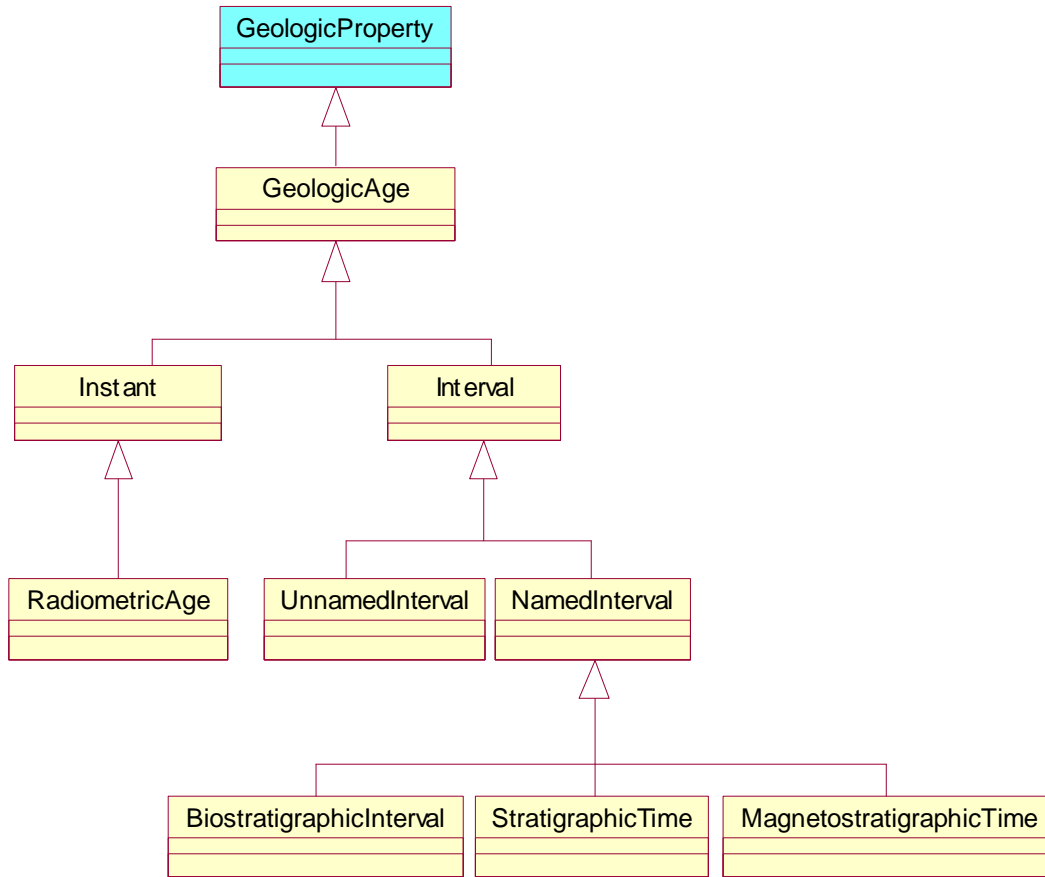
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Controlled Vocabulary

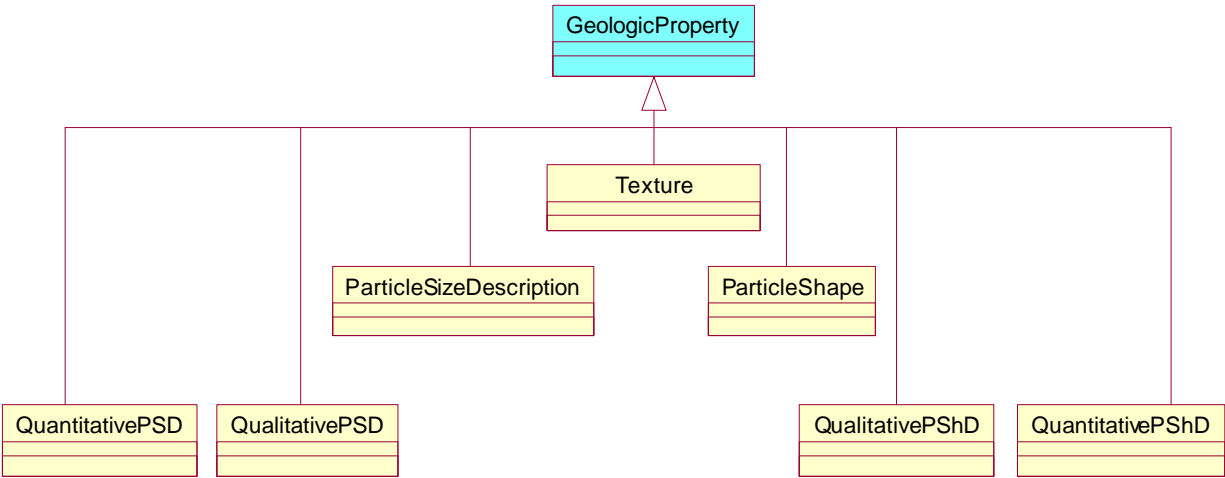
Geologic Portrayal



Geologic Property

Geologic Age

Texture



CONCEPTS

AllostratigraphicUnit

Allostratigraphic Unit

DF: A body of sedimentary rock that is distinguished on the basis of its bounding discontinuities. [NASC, 1983]

SN: Must be mappable. Examples of boundaries are faults, disconformities, and paleosols.

[Derived from GeologicUnit](#)

BaseMap

[Derived from GeologicProperty](#)

BeddingSurface

Bedding Surface

DF: A planar or nearly planar surface that visibly separates each successive layer of stratified rock (after Jackson, 1997).

SN: Construed narrowly to not generally include bedforms such as cross bedding.

BT: sedimentary structure

[Derived from PreLithificationStructure](#)

BiostratigraphicInterval

Biostratigraphic Interval

DF: Defined based on fossil or fossil assemblage.

[Derived from NamedInterval](#)

BiostratigraphicUnit

Biostratigraphic Unit

DF: A body of Earth materials distinguished on the basis of its fossil content. [NASC, 1983]

SN: Generally independant from lithostratigraphic and chronostratigraphic units.

Private attribute:

Type [interval, assemblage, abundance]

[Derived from GeologicUnit](#)

CartoGraphic

includes labels, leader lines, other annotations, etc.

[Derived from Graphic](#)

Cast

Cast

DF: Material having the gross morphology of a fossil organism, composed of material different from the original by replacement.

[Derived from Fossil, CompoundMaterial](#)

ChemicalComposition

[Derived from GeologicProperty](#)

ChronostratigraphicUnit

Chronostratigraphic Unit

DF: A body of rock designated to serve as the material reference for all rocks formed during the same period of time. [NASC, 1983]

SN: Each boundary is synchronous and therefore usually does not conform to lithostratigraphic or biostratigraphic units

[Derived from GeologicUnit](#)

ClassSymbol

[Derived from LegendItem](#)

Color

[Derived from GeologicProperty](#)

CompoundGeologicStructure

[Derived from GeologicStructure](#)

CompoundMaterial

Compound Material

DF: An Earth Material composed of a mixture of Earth Materials, possibly including other Compound Materials.

SN: Includes consolidated and unconsolidated materials as well as mixtures of consolidated and unconsolidated materials.

[Derived from EarthMaterial](#)

ConsolidatedMaterial

[Derived from EarthMaterial](#)

ConsolidationDegree

[Derived from GeologicProperty](#)

Contact

Contact

DF: A plane or irregular surface between two types or ages of rock [from page 137 of Jackson, 1997]

SN: Includes: secondary features such as faults where the feature separates two types of rocks.

Includes: faults, intrusive borders, bedding planes, and unconformities.

[Derived from GeologicStructure](#)

ControlledVocabulary

Classification schemes are collections of normative descriptions that define subsets of some domain (geologic time, rocks, non-consolidated deposits...). Any thing in the domain may belong to only one class (and its parent classes..) in a particular classification scheme defined on that domain.

In our discussions we have tended to avoid specifying that a classification scheme must partition a domain (i.e. every thing in the domain belongs to exactly one class in the scheme).

[Derived from GeologicConcept](#)

Correlation Chart

[Derived from GeologicPortrayal](#)

Cross-section

Cross-section

DF: A diagram or drawing that shows features transected by a given plane. [Jackson, 1997]

[Derived from GeologicPortrayal](#)

Crystalization

Transition from liquid state to solid state

[Derived from GeologicProcess](#)

Deformation

Deformation:

DF: The folding, faulting, shearing, compressing, or extending of Earth Materials as a result of any Earth force.

[adap. from Jackson, 1997]

SN: Includes pre-lithification and post-lithification effects.

[Derived from GeologicProcess](#)

Deposition

Deposition

DF: The constructive accumulation of any Earth material by a natural agent. [DMDT]

SN: Generally refers to sedimentary materials. Includes evaporation products and accumulations from the death of plants and animals.

[Derived from GeologicProcess](#)

DiachronicUnit

Diagenesis

Diagenesis

DF: The sum of all chemical, physical, and biological changes to an Earth material that take place after initial accumulation or deposition and during and after lithification. [adapt. Jackson, 1997]

SN: Encompasses all kinds of Earth materials. Excludes weathering and metamorphism.

[Derived from GeologicProcess](#)

discontinuity

[Derived from GSDefiningElement](#)

Displacement

EarthMaterial

Earth Material

DF: A naturally occurring constituent of the Earth.

SN: The state of the constituent without genetic /process interpretation. Includes glass-->not abstract.

NT: EarthConstituent, GeologicConstituent

[Derived from GeologicConcept](#)

EMConstituent

[Derived from GeologicRelation](#)

EMCRelation

[Derived from GeologicRelation](#)

EMCRelationRole

Derived from [GeologicRole](#)

EMCRole

Derived from [GeologicProperty](#), [GeologicRole](#)

EMGenesis

Derived from [Genesis](#)

Erosion

Erosion

DF: Processes by which materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another, by natural agencies. [Jackson, 1997]

SN: Includes: weathering, solution, corrosion, and transportation. Excludes: mass wasting.

Derived from [GeologicProcess](#)

Extent

Derived from [GeologicProperty](#)

Fabric

Fabric

SN: At fine scale, not cleanly distinguished from texture.

Derived from [GeologicProperty](#), [CompoundGeologicStructure](#)

Fault

Fault

DF: A discrete surface or zone of discrete surfaces separating two rock masses across which one mass has slid past the other. [Jackson, 1997]

Derived from [GeologicStructure](#)

Fluid

Derived from [EarthMaterial](#)

Fold

Fold

DF: A curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage. [Jackson, 1997]

[Derived from GeologicStructure](#)

Foliation

Foliation

DF: A planar arrangement of textural or structural feature in any type of rock. [Jackson, 1997]

[Derived from GeologicStructure](#)

Form

rock body geometry

[Derived from GeologicProperty](#)

Fossil

Fossil

DF: The remains (original or replaced), impression, or traces of organisms in rocks or sediments.

SN: Includes ichnofossils, casts and molds, as well as preserved remains.

[Derived from GeologicConcept](#)

Fracture

Fracture

DF: A crack in a rock where the movement of rock separated by the fracture is normal to the surface. [Jackson, 1997]

[Derived from GeologicStructure](#)

Genesis

[Derived from GeologicProperty](#)

GeneticEvent

[Derived from Universe](#)

GeochronologicUnit

GeologicAge

Geologic Age

DF: An abstract class for geologic ages; composite ages are possible but not detailed here.

[Derived from GeologicProperty](#)

GeologicClass

concept that associated with more than one occurrence

[Derived from GeologicProperty, Universe](#)

GeologicConcept

Geologic Concept

DF: concepts related to:

"The study of the planet Earth--the materials of which it is made, the processes that act on these materials, the products formed, and the history of the planet and its lifeforms since its origin." [Jackson, 1997; pp265]

[Derived from Universe](#)

GeologicEnvironment

A complex object that needs to be fleshed out

[Derived from GeologicProperty](#)

GeologicGraphic

a graphic representation of a geologic portrayal

[Derived from GeologicPortrayal, Graphic](#)

GeologicMap

Geologic Map

DF: A map on which is recorded geologic information, such as the distribution, nature, and age relationships of rock units, and the occurrence of structural features, mineral deposits, and fossil localities. [Jackson, 1997]

[Derived from GeologicPortrayal](#)

GeologicPortrayal

A visualization of spatially referenced geologic information.

[Derived from GeologicConcept](#)

GeologicProcess

Geologic Process

DF: Defines a kind of geologic event that acts on a geologic entity to produce another. [DMDT]

[Derived from GeologicConcept](#)

GeologicProperty

[Derived from GeologicConcept](#)

GeologicRelation

Geologic Relation

DF: Describes the type of relationship between two geologic entities. [DMDT]

SN: Includes spatial, temporal, sequence, correlation, and parent/child relations.

[Derived from GeologicConcept](#)

GeologicRole

GeologicRole represents a dependent thing, defined by a relationship between two or more other things.

[Derived from GeologicProperty](#)

GeologicStructure

Geologic Structure

DF: An observable pattern, disposition, attitude, arrangement, or relative position of Geologic Units, or Earth Materials or portions thereof. The megascopic form or mutual relations of the parts of a rock mass.

SN: "It is concerned with rock-units (of any kind, large or small), but not with the particles composing the rock (texture)." [3] Challinor, 1978.
Concerned with rock units of any kind, large or small, but not with the characteristics of particles composing the rock (that would be included in texture)
Includes: sedimentary structures.
Includes: broad features [3]
Excludes: fine features [3].

BT: geologic thing

NT: primary structure, secondary structure

[Derived from GeologicConcept](#)

GeologicTimeScale

[Derived from ControlledVocabulary](#)

GeologicUnit

Geologic Unit

DF: A volumetric body of Earth materials distinguished by content (lithologic or fossil), inherent attributes, physical limits, or geologic age. [NASC, 1983]

SN: Excludes non-material, temporal units.

RT: Rock Unit, Map Unit

Geologic Units are related using g the genereal relation structure

[Derived from GeologicConcept](#)

[Private Attributes:](#)

DefiningCriteria : Concept

GeologicUnitPart

[Derived from GeologicRelation](#)

GeometricDescription

Orientation
Thickness
Planar/Linear
Fold wavelength and amplitude

[Derived from GeologicProperty](#)

GeomorphologicUnit

Geomorphologic Unit

DF: A geologic unit defined by surface landforms and the associated Earth processes that formed them. [DMDT]

SN: Common usage in surficial deposits mapping.

[Derived from GeologicUnit](#)

Glass

Glass

DF: Solid inorganic material intermediate between the close-packed, highly ordered array of a crystal and the poorly packed, highly disordered array of a gas.

SN: Generally the product of the rapid cooling of a magma. Includes: volcanic glasses and clinkers.

Excludes: chert and other crypto-crystalline materials.

[Derived from ConsolidatedMaterial, Fluid](#)

GrainsizeDistribution

Grain Size Distribution

SN: Includes: various distribution parameters:

grain size
grain sorting
skewness
kurtosis
etc.
modal grain size analysis

also possibly grain discernability:

If the constituents in the whole are too small to discern, then the aggregate material can not be described in terms of its parts. This attribute would have 3 values--aphanitic, phaneritic, and aphanitic and phaneritic (glassy porphyritic volcanic rocks...)

[Derived from GeologicProperty](#)

Graphic

includes raster images and vector representations

[Derived from Universe](#)

GSDefiningElement

[Derived from GeologicProperty](#)

GUGenesis

[Derived from Genesis](#)

GUPRelation

[Derived from GeologicRelation](#)

GUPRelationRole

[Derived from GeologicRole](#)

GURole

[Derived from GeologicRole](#)

Horizon

[Derived from GeologicProperty](#)

HydrothermalAlteration

Hydrotherman Alteration

DF: The alteration of rocks or minerals by the reaction of hydrothermal fluid with pre-existing solid phases. [Jackson, 1997]

[Derived from GeologicProcess](#)

Instant

Instant

DF: An abstract class for geochronologic ages.

[Derived from GeologicAge](#)

Interval

Interval

DF: An abstract class for geologic time interval.

[Derived from GeologicAge](#)

Private Attributes:

lowerBound : Age

upperBound : Age

lowerInstant : Instant

can be calculated from lower bound-->consistency constraint.

upperInstant : Instant

can be calculated from upper bound-->consistency constraint.

Intrusion

Intrusion

DF: The process of injection of unlithified Earth material into pre-existing rock or sediment. [DMDT]

SN: Includes magma in the igneous sense, as well as sedimentary dikes and diapirs.

[Derived from GeologicProcess](#)

IntrusiveRelation

Intrusive Relation

DF: Describes the spatial or temporal relationships of cross cutting rock bodies. [DMDT]

[Derived from GeologicRelation](#)

Joint

[Derived from Fracture](#)

layer

[Derived from GSDefiningElement](#)

Layering

Layering

DF: Repeating tabular bodies of rock, ice, or unconsolidated material.

[Derived from GeologicStructure](#)

Legend

[Derived from Universe](#)

LegendItem

[Derived from GeologicRelation](#)

Lineation

DF: A locally linear structure or fabric in a rock. [Jackson, 1997]

SN: Includes: flow lines, scratches, striae, slickensides, linear arrangements of components in sediments, fold axes, elongate minerals, crinkles, minute folds, and lines of intersection.

[Derived from GeologicStructure](#)

LithodemicUnit

Lithodemic Unit

DF: A body of predominantly intrusive, highly deformed, and/or highly metamorphosed rock distinguished on the basis of lithic characteristics. [NASC, 1983]

SN: Generally lacks primary stratification. Generally independent from geologic history. Does not conform to law of superposition. Includes dikes.

[Derived from GeologicUnit](#)

LithologyClassification

[Derived from ControlledVocabulary](#)

LithostratigraphicUnit

Lithostratigraphic Unit

DF: A body of sedimentary, extrusive igneous, metasedimentary, or metavolcanic strata distinguished on the basis of lithic characteristics and stratigraphic position. [NASC, 1983]

SN: Generally conforms to law of superposition. Generally independent from geologic history and time.

[Derived from GeologicUnit](#)

LithotectonicUnit

Lithotectonic Unit

DF: An assemblage of rocks that is unified on the basis of structural or deformational features, mutual relations, origin, or historical evolution. [Jackson, 1997]

SN: Can be igneous, sedimentary, or metamorphic rock.

[Derived from GeologicUnit](#)

MagnetostratigraphicTime

Magnetostratigraphic Time

DF: Defined based on determination of polarity reversals.

[Derived from NamedInterval](#)

MagnetostratigraphicUnit

Magnetostratigraphic Unit

DF: A body of rock distinguished by specific remanent-magnetic properties differing from those in adjoining units. [NASC, 1983]

SN: Can be based on polarity, dipole-field-pole position, non-dipole component, or field intensity. Generally independent from geologic history.

Private Attribute: RemanentType [see SN]

[Derived from GeologicUnit](#)

MapDescription

[Derived from Universe](#)

materialboundary

[Derived from GSDefiningElement](#)

MetaData

[Derived from Universe](#)

MetamorphicGrade

[Derived from GeologicProperty](#)

Metamorphism

Metamorphism

DF: The mineralogical, chemical, and structural adjustment of solid rocks to physical and chemical conditions which have generally been imposed at depth below the surface zones of weathering and cementation, and which differ from the conditions under which the rocks in question originated. [Jackson, 1997]

[Derived from GeologicProcess](#)

Metasomatism

Metasomatism

DF: The process of practically simultaneous dissolution and deposition by which a new mineral of partly or wholly chemical composition may grow in the body of an old mineral or mineral aggregate. [Jackson, 1997]

SN: Generally occurs with little volume change or textural disturbance.

[Derived from GeologicProcess](#)

Mineral

Mineral

DF: A naturally occurring inorganic element or compound having a periodically repeating arrangement of atoms and a characteristic chemical composition or range of compositions, resulting in distinctive physical properties.

SN: Includes mercury as a general exception to the requirement of crystallinity.

[Derived from EarthMaterial](#)

Mineral

[Derived from ConsolidatedMaterial](#)

Mold

Mold

DF: Impressions or cavities in rock or sediment matrix having the gross morphology of a fossil organism, formed when the buried organism's original material was removed by dissolution.

[Derived from Fossil, GeologicStructure](#)

Name

[Derived from GeologicProperty](#)

NamedInterval

Named Interval

DF:

SN: e.g. Jurassic, Precambrian, Magneto BB stratigraphic zone

[Derived from Interval](#)

[Private Attributes:](#)

Name : String

Name of the interval, e.g. Jurassic.

This name is valid only within a specific classification scheme (ontology) i.e. "time scale". The relationship to the time scales tbd.

Occurrence

[Derived from Universe](#)

OccurSymbol

[Derived from LegendItem](#)

OrganicMaterial

Organic Material

DF: An Earth Material consisting primarily of the remains of organisms.

SN: Includes sediments, sedimentary rocks, and soils. Includes high-carbon Earth Materials such as bitumen, peat, and coal.

[Derived from ConsolidatedMaterial, EarthMaterial](#)

orientedParticle

[Derived from GSDefiningElement](#)

OutcropCharacter

[Derived from GeologicProperty](#)

ParticleShape

[Derived from GeologicProperty](#)

ParticleSizeDescription

[Derived from GeologicProperty](#)

PedodermicUnit

Pedodermic Unit

DF: A unit mantle of soil, entirely or partially truncated, at the Earth's surface or partially or wholly buried, which has physical characteristics and stratigraphic relationships that permit its consistent recognition and mapping. [Jackson, 1997]

SN: May be modified or even made by humans [1]

[Derived from GeologicUnit](#)

PedostratigraphicUnit

Pedostratigraphic Unit

DF: A buried body of rock distinguished by one or more pedologic horizons and overlain by one or more formally-defined lithostratigraphic or allostratigraphic units. [NASC. 1983]

SN: Developed in one or more lithostratigraphic, allostratigraphic, or lithodemic units. Distinct from pedogenic units in that they are not entirely composed of pedologic materials.

[Derived from GeologicUnit](#)

Pervasiveness

Penetrative or discrete

[Derived from GeologicProperty](#)

PhysicalProperty

e.g., density, velocity, etc.

Polarity-ChronologicUnit**Polarity-ChronostratigraphicUnit**

Polarity-Chronostratigraphic Unit

DF: A body of rock that contains the primary magnetic-polarity record imposed when the rock was deposited or crystallized during a specific interval of geologic time. [NASC, 1983]

SN: Defined in terms of magnetostratigraphic units

[Derived from GeologicUnit](#)

Preference

Vocabularies have only one preferred name

[Derived from GeologicProperty](#)

PreLithificationStructure

PreLithification Structure

DF: Structure determined before lithification. [paraphrased from page 510 of Jackson, 1997]

SN: Includes soft-sediment deformation and other secondary sedimentary structures occurring prior to lithification; structures that form in igneous rocks before lithification.

UF: bedform, sedimentary structures, igneous depositional structures

[Derived from GeologicProperty, GeologicStructure](#)

PreservedRemain

Preserved Remain

DF: The original materials comprising an organism's body or shell.

SN: Includes recrystallized but not replaced material.

[Derived from Fossil, CompoundMaterial](#)

Process**Projection**

Same as projection for MapDescription

[Derived from GeologicProperty](#)

Proportion

[Derived from GeologicProperty](#)

QualitativePSD

Derived from [GeologicProperty](#)

QualitativePShD

Derived from [GeologicProperty](#)

QuantitativePSD

Derived from [GeologicProperty](#)

QuantitativePShD

Derived from [GeologicProperty](#)

RadiometricAge

Radiometric Age

DF: An age based on decay of radiometric isotopes.

Derived from [Instant](#)

Rank

Derived from [GeologicProperty](#)

Rock

Rock

DF: A consolidated aggregate of one or more minerals, or a body of undifferentiated mineral matter, or of solid organic material.

SN: Includes mineral aggregates such as granite, shale, marble; mineral matter, such as obsidian; and organic material, such a coal. Excludes unconsolidated materials.

Derived from [CompoundMaterial](#), [ConsolidatedMaterial](#)

Sample

Sample

DF: Material Samples: physical specimens

SN: has properties such as: scale, location, etc.

Derived from [GeologicProperty](#), [Occurrence](#)

Scale

Derived from [GeologicProperty](#)

Sedimentation

Sedimentation

DF: The process of depositing sediment by mechanical means from a state of suspension in air or water. [Jackson, 1997]

SN: A limited definition to exclude other processes related to the erosion, deposition, and lithification of sediment.

[Derived from Deposition](#)

shapedsurface

[Derived from GSDefiningElement](#)

SpatialObject

[Derived from Universe](#)

SpatialRelation

I'm not sure we need this class here. Each of the other specific relation types have a spatial component.

[Derived from GeologicRelation](#)

StratigraphicRelation

Stratigraphic Relation

DF: Describes the spatial, temporal, or hierarchical relationships of stratigraphic units. [DMDT]

[Derived from GeologicRelation](#)

StratigraphicTime

Stratigraphic Time

DF: Defined based on stratotype.

[Derived from NamedInterval](#)

StructuralRelation

Structural Relation

DF: Describes the spatial, temporal, or hierarchical relationships between two geologic structures or between a geologic structure and the rock units that encompass it. [DMDT]

[Derived from GeologicRelation](#)

Symbol

[Derived from Graphic](#)

TemporalRelation

I'm not sure we need this class here. Each of the other specific relation types have a temporal component.

[Derived from GeologicRelation](#)

TextDescription

[Derived from GeologicProperty](#)

Texture

Texture

DF: General physical appearance or character of a rock including geometric aspects of and mutual relations among its component particles or crystals.

SN: Term is applied to smaller (megascopic and microscopic) features as seen on smooth surface of a homogeneous rock or aggregate. Not cleanly distinguished from fine-scale structure.

Texture may have properties such as: particle sorting, size, size variation, shape, packing, orientation, pore space, and possibly others.

BT: geologic property

[Derived from GeologicProperty](#)

TraceFossil

Trace Fossil

DF: Marks, trails, tracks, burrows, or other structural evidence of the behavior of an organism preserved in rocks or sediments.

SN: Generally does not include preserved or replaced remains, casts or molds.

NT: ichnofossil

[Derived from Fossil, GeologicStructure](#)

Unconsolidated

Unconsolidated Material

DF: An Earth Material that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth.

SN: Includes sediment, soil, volcanic material, etc.

[Derived from CompoundMaterial](#)

UnconsolidatedMaterial

An unconsolidated compound earth material that

Alternate name: Sediment

Non-preferred term: Soil (as a material) because of confusion with pedogenic units

[Derived from EarthMaterial](#)

Universe

Universe

DF: "A neutral representation for the universal type" [Sowa, 2000, p.68]

UnnamedInterval

Un-named interval.

Derived from Interval

VoidDescription

Description of void space, e.g. pores, cavities, caves

Volcanism

Volcanism

DF: The process by which magma and its associated gases rise into the crust and are extruded onto the Earth's surface and into the atmosphere. [Jackson, 1997]

Derived from GeologicProcess

WeatheringCharacter

Derived from GeologicProperty

TOTALS:

146 Classes